

# NEWSLINE

Published weekly for employees of Lawrence Livermore National Laboratory

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## Riding the DNA roller coaster

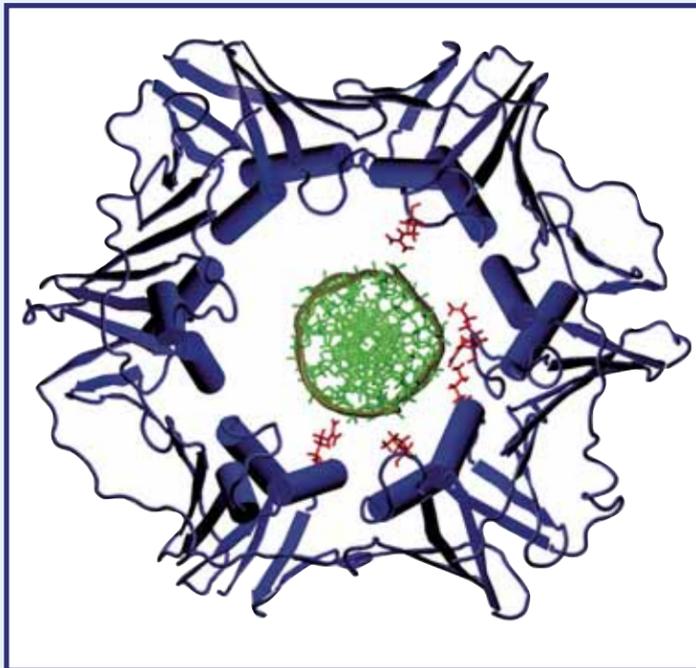
By Charles Osolin

NEWSLINE STAFF WRITER

Picture a thoroughbred racehorse galloping down the home stretch, its hooves pounding the turf in a furious, naturally choreographed sequence of movement and motion.

Something like this occurs every time a living cell gets ready to divide. In order to replicate itself, a cell must first make a copy of its DNA, the remarkable molecules that carry an organism's genetic code.

It happens fast. The enzyme responsible for duplicating DNA, known as DNA polymerase, careens along the DNA at a break-neck pace while cooperative enzymes unzip the two strands of the DNA's double helix just ahead. As the two strands separate, the DNA polymerase grabs free nucleotide bases the chemical As, Ts, Gs and Cs that pair up to form the rungs of the helix and strings them together according to complementary bases on



DANIEL BARSKY/BIOSCIENCES

Molecular dynamics simulations show how a DNA "sliding clamp" (blue) travels along a DNA strand (green and gold).

each existing strand, creating a new, double-stranded copy of the original DNA. A similar process occurs when a section of DNA

See DNA, page 7

## Anastasio to present 'Lab Update' Monday

Director Michael Anastasio will deliver a "Laboratory Update" at 10 a.m. Monday, April 11, in the Bldg. 123 auditorium. Employees are invited to attend. The presentation will be broadcast live on Lab TV channel 2. Signage will be available. Call Cathy Kaplan, 2-6555.

## Human chromosome study offers intriguing new clues to mystery of 'gene deserts'

By Charles Osolin

NEWSLINE STAFF WRITER

Some new clues to the mystery of "gene deserts" — long stretches of DNA in the human and other mammalian genomes that contain no protein-coding genes — have been uncovered by scientists studying human chromosomes 2 and 4.

Chromosome 4 contains the largest gene deserts in the human genome. In a paper published yesterday (April 7) in the journal *Nature*, LLNL bioinformatics scientist Ivan

See GENES, page 5

## Ambassador Linton Brooks discusses weapons program before Senate subcommittee

*Editor's note: Linton Brooks, administrator for the National Nuclear Security Administration, testified before the Senate Armed Services Committee Subcommittee on Strategic Forces April 4 about the nation's nuclear weapons programs and policies. Following are excerpts from his testimony. The full text of Brook's statement is available on the NNSA Website: <http://www.nnsa.doe.gov/>*

Mr. Chairman, thank you for the opportunity to appear before you today to discuss nuclear weapons programs and policies. I look forward to working with you in this new area of responsibility. I also want to thank all of the Members for their strong support for critical national security activities. Before I begin my remarks, I want to say how pleased I am to be on this

See BROOKS, page 3



JACQUELINE MCBRIDE/NEWSLINE

## On target

Associate Director for the National Ignition Facility (NIF) George Miller provides an overview of the giant laser project to Carl Kime, appropriations representative for Rep. Jerry Lewis of California. Also joining the tour, but not pictured, was Scott Sudduth, assistant vice president of Federal Government Relations for the University of California. Kime examines a one-tenth scale model of NIF's target chamber. During his one day visit, Kime also received briefings on stockpile stewardship, advanced simulation and computing and nonproliferation and homeland security.



Popular science series hits the road

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Chelle Clements' community service credo

— Page 5



Ensuring eagle's golden future

— Page 8



## LAB COMMUNITY NEWS

### Weekly Calendar

Technical Meeting Calendar, page 4

**Saturday**  
**9**

The Lab's "Science on Saturday" lecture series travels to the Central Valley's Delhi High School Theatre today in Delhi. Allen Christian, deputy division leader, LLNL Biosciences, Biodefense Division, will present, "Inside Forensics: Behind CSI." (see page 3 for more information.)

**Tuesday**  
**12**

The Livermore Computing customers monthly meeting will be held today at 9:45 a.m. in Bldg. 453, room 1001, Armadillo Room. Nir Goldman of Chemistry and Materials Science Directorate will present a talk on "Simulations of Water in Giant Planets." For more information, call Teresa Delpha, 3-7329.

**Wednesday**  
**13**

Attention **post docs**. Back by popular demand, Jim Felton, senior biomedical scientist in the Biosciences Directorate, will give a talk titled, "How Do I Get My Grant Funded? An Insiders Look at Grantsmanship," today at noon to 1:30 p.m. in Bldg. 219, room 163. Felton will share his expertise and tips regarding receiving grant funds. Participants are welcome to bring their lunch.

If you don't have access to Bldg. 219, there are new Temporary Building Access procedures in place where approval may be granted within two working days. Foreign national post docs should talk to their administrative support staff regarding Temporary Building Access procedures. Additional information can be found at: [http://www-r.llnl.gov/foreign\\_nationals/index.html](http://www-r.llnl.gov/foreign_nationals/index.html). For more information, contact Beverly Williams, University Relations Program, 2-5020.

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The LLNL Armed Forces Veterans Association (LLAF-VA) is currently helping Blue Star Moms collect DVDs and CDs to send overseas for troops in Iraq and those who have been wounded. Landstuhl Medical Hospital in Germany has a project called "Take a Soldier to a Movie." Individual packages are put together that include a DVD, popcorn, candy, an AT&T phone card and a letter(s) from people back home. For those overseas, there can be many hours of down time on long deployments, and having movies to watch helps the time go faster. To donate used or new DVDs or CDs, contact Chelle Clements, 3-8134, or Bob Gallegos, 3-6997.

### Smithsonian visit



DON JOHNSTON/NEWSLINE

From left: John Ross, a former editor and current writer for *Smithsonian* magazine, the Lab's John Densberger, and Steven King, a consultant who has worked with Ross, get an overview of the BlueGene/L supercomputer in the Terascale Simulation Facility from Doug East of Computation during a recent visit. Ross, who was invited to the Laboratory by National Ignition Facility (NIF) Project Manager Ed Moses, also toured NIF and the Discovery Center.

## IN MEMORIAM

### Delmar E. Loewe

Delmar E. Loewe, a resident of Walnut Creek for 50 years and a Lab retiree, died on April 2, after a lengthy illness. He was 82.

Born Dec. 19, 1922, in Toppenish, Wash., Loewe eventually served in the United States Army Corps in Europe during World War II and graduated from the University of Washington in Seattle after the war. He worked for Albers Milling Company in Oakland until 1960, when he came to the Lab.

He worked in Hazard Control, Special Materials, and retired from the Geothermal and Energy Program in 1986.

Loewe is survived by his wife of 59 years, Evelyne A. Loewe, also of Walnut Creek, daughters Vivian Sutton and Frances Gabie of Walnut Creek, and a son, Del Loewe of Livermore. He is also survived by seven grandchildren and four great grandchildren. A memorial service will be conducted at Hull's Chapel, 1139 Saranap Ave., Walnut Creek, on April 11, followed by the burial services, which will be observed at the San Joaquin National Cemetery in Gustine.

Contributions in his memory may be made to the Contra Costa Hospice Foundation or American Cancer Society.

### With view to future, Earth Expo returns

Earth Expo 2005 will be held from 11:30 a.m. to 1:30 p.m. on Wednesday, April 20, on the lawn area next to the former pool area.

The theme to this year's Earth Day celebration is "Protecting our Children and our Future."

It will provide a chance to connect with environmentally-oriented community groups, vendors of earth-friendly products, Lab researchers and government agency representatives.

It also will be a time to celebrate the Earth with good food and music. Look for additional details in next Friday's *Newsline*. For more information, contact Michael Meltzer, 4-6923.

## Newsline

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### Contacts:

Media & Communications manager: Lynda Seaver, 3-3103

Newsline editor: Don Johnston, 3-4902

Contributing writers: Bob Hirschfeld, 2-2379; Linda Lucchetti, 2-5815; Charles Osolin, 2-8367; David Schwoegler, 2-6900; Anne M. Stark, 2-9799; Stephen Wampler, 3-3107. For an extended list of Lab beats and contacts, see <http://www.llnl.gov/pao/contact/>

Photographer: Jacqueline McBride

Designer: Julie Korhummel, 2-9709

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**Public Affairs Office:** L-797 (Trailer 6527), LLNL, P.O. Box 808, Livermore, CA 94551-0808

**Telephone:** (925) 422-4599; Fax: (925) 422-9291

**e-mail:** [newsline@llnl.gov](mailto:newsline@llnl.gov) or [newsonline@llnl.gov](mailto:newsonline@llnl.gov)

**Web site:** <http://www.llnl.gov/pao/>

# Science on Saturday lecture series heads to Central Valley

The Lab's popular "Science on Saturday" lectures will take to the road, traveling to Merced County in April and May to offer the following presentations.

- April 9, "Inside Forensics: Behind CSI," by Allen Christian, deputy division leader, LLNL Biosciences, Biodefense Division, at Delhi High School Theatre, Delhi.

- April 23, "Biodefense: Detection to Protect the Nation," by Frank Chuang, biomedical engineer, U.C. Davis and LLNL, at Buhach Colony High School



Theater, Atwater.

- May 14, "From the Big Bang to California: Observation of the Universe," by Wil van Breugel, research astronomer, LLNL Institute of Geophysics and Planetary Physics, at Los Banos High School, Los Banos.

"We bring SOS to promote interest in science and technology among students in the Central Valley. SOS offers students an opportunity to experience the excitement of the Laboratory's big science," said Richard Farnsworth, manager of the Lab's Science and Technology Education Program (STEP).

All lectures are free and will begin at 9:30 a.m. and end at 11:30 a.m. Seating is on a first come, first

served basis. The talks are intended for junior high, high school, and college students. The topics are selected from cutting edge science and technology research in a variety of disciplines.

The series is sponsored by LLNL's Science and Technology Education Program (STEP) in partnership with Merced College, Merced Union High School District, Los Banos Unified School District, Delhi Unified School District, Merced County Office of Education, and the University of California, Merced.

For a complete list of lectures, topics, and directions to each lecture location, go to the Web at <http://www.mccd.edu/mcti/sos/2005/default2005.htm>.

## BROOKS

*Continued from page 1*

panel today with my colleague, Gen. James E. Cartwright, commander of United States Strategic Command, who will present the military perspective on these issues.

Today, I will discuss with you the Administration's emerging vision for the nuclear weapons enterprise of the future, and the initial steps we will be taking, with your support, to realize that vision. This vision derives from the work of the Nuclear Posture Review (NPR), the August 2003 Conference at Strategic Command, the follow-on NPR Strategic Capabilities Assessment and related work on a responsive nuclear infrastructure — key elements of which are addressed in Acting Assistant Secretary of Defense Mira Ricardel's written statement submitted for the record. The Nuclear Weapons Complex Infrastructure study, currently underway and scheduled to be completed this summer, will further refine this vision. I should add that Gen. Cartwright and the Directors at our three national laboratories have provided both leadership and creative impetus to this entire effort.

The NPR has resulted in a number of conceptual breakthroughs in our thinking about nuclear forces —

breakthroughs that have enabled concrete first steps in the transformation of our nuclear forces and capabilities. The recognition of a more dynamic and uncertain geopolitical threat environment but one in which Russia does not pose an immediate threat, the broad reassessment of the defense goals that we want nuclear forces to serve, and the evolution from a threat-based to a capabilities-based nuclear force have enabled substantial reductions in operationally-deployed strategic warheads through 2012 as reflected in the Moscow Treaty. This has also led to the deep reduction, directed by the President last May, in the total nuclear weapons stockpile required to support operationally-deployed forces. By 2012 the stockpile will be reduced by nearly one-half from the level it was at the time this administration took office resulting in the smallest nuclear stockpile in decades. This represents a factor of four reduction in the stockpile since the end of the Cold War.

Very importantly, the NPR articulated the critical role of the defense R&D and manufacturing base, of which a responsive nuclear weapons infrastructure is a key element, in the New Triad of strategic capabilities. We have worked closely with the Department of Defense to identify initial steps on the path to a responsive nuclear infrastructure and are beginning to implement them.

Building on this progress, I want to address the cur-

rent state of our thinking about the characteristics of the future nuclear weapons stockpile and supporting nuclear infrastructure. Specifically, I will address three key questions:

- What are the limitations of today's stockpile and nuclear infrastructure?
- Where do we want the stockpile and infrastructure to be in 2030?
- What's the path to get there?

In laying out these ideas, the Administration hopes to foster a more comprehensive dialog with Congress on the future nuclear posture. I must first emphasize, however, that today stockpile stewardship is working, we are confident that the stockpile is safe and reliable, and there is no requirement at this time for nuclear tests. Indeed, just last month, the Secretary of Energy and Secretary of Defense reaffirmed this judgment in reporting to the President their ninth annual assessment of the safety and reliability of the U.S. nuclear weapons stockpile. Like the eight certifications that preceded it, this year's assessment is based on a collective judgment of the directors of our national laboratories and of the commander, U.S. Strategic Command, the principal steward of our nuclear forces. Our assessment derives from ten years of experience with science-based stockpile stewardship, from extensive surveillance, from the use of both experiments and computation, and from professional judgment.

## BRIEFLY

### **Big improvements to cause small delay**

The Lab has contracted with B&B Grading and Paving Inc. to improve the Westgate Drive traffic circle. The work is tentatively scheduled to take place from April 13 to May 23. The construction will affect pedestrian and vehicle traffic as follows:

- On weekdays the circle will remain open for traffic, but the roadway will be narrow and the vehicle speed limit will be reduced.
- On some weekends the circle will be closed to traffic: watch for "road closed" and "detour" signs. The other weekends the circle will remain open with the weekday restrictions.

Take special care to drive safely while construction is in progress. Observe all traffic warning signs, barricade lines and the posted speed limit.

For more information about the project and roadway conditions, call Steven Shih, Plant Engineering construction manager, 3-9308, or Inspector Al Alvarado, 3-4068.

### **New DOE/NNSA clearance form**

The Security Department's Personnel Security Division was recently notified that effective last Friday (April 1), the DOE/NNSA Albuquerque Service Center no longer accepts the LL6370 "Clearance Justification and Certification" (CJC) form. A new DOE/NNSA standardized clearance justification has taken its place. All CJC's submitted to the Central Clearance Group prior to April 1 will be accepted and will not need to be resubmitted on the new form.

The new DOE F 472.1 Clearance Request/Recertification/Suitability form is available as an Informed Filler document and instructions and helpful hints are provided with the new form. The current CJC form will be unavailable in the LLNL forms server once the transition to the new form has occurred. Contact Kelly Karstens at 4-4909 or [karstens1@llnl.gov](mailto:karstens1@llnl.gov) for questions or concerns or check the Website ([http://www-r.llnl.gov/securityprogram/central\\_clearance/news.html](http://www-r.llnl.gov/securityprogram/central_clearance/news.html)) for updates, training information and implementation of the new form.

### **Where to go with a good idea**

Attention Inventors: If you'd like to learn more about how to patent, develop, and license your bright ideas, a great place to start is the Laboratory's Industrial Partnerships and Commercialization Office (IPAC). IPAC has assigned business development executives to work with each directorate on industrial partnering issues; and each directorate has assigned a directorate liaison to work with IPAC. Together they coordinate a variety of intellectual property and industrial partnering issues for their respective directorates. To find the IPAC business development executive and directorate representative for your area, go to IPAC's Internal Resources for LLNL Employees (<http://www-r.llnl.gov/IPandC/emp/>) Website and click on the flier titled, "The Industrial Partnerships and Commercialization Office." While you're there, check out some of the other informative fliers about technology transfer and commercialization.

### **Academic plan request deadline looms**

EODD is continuing to process requests for funding of degree programs on a quarterly basis. Review and approvals are done quarterly, rather than monthly, by the Student Policy Committee. FY05 deadlines for submission of Graduate and Undergraduate Academic Plans are as follows: May 2, Aug. 1 and Nov. 1. All requests should be sent to the Education Office, L-728. Requesters will be notified following the Student Policy Committee meeting scheduled for the first Thursday of the following month. For additional information, contact the Education Office, 4-5479.

### **Depression support group forms**

Feeling sad, blue, or hopeless? Lost interest in things you used to enjoy? Decreased job performance or productivity? Increasingly irritable with co-workers or family? Difficulty concentrating or making decisions? Unfortunately many depressed people suffer needlessly because they feel embarrassed, fear being perceived as weak, or do not recognize depression as a treatable illness. The key is to recognize the symptoms of depression and seek appropriate treatment.

The Employee Assistance Program (EAP) offers an on-site, convenient support group which will provide a safe environment to share experiences, learn from others who may have the same symptoms as you, and develop adaptive coping strategies. For more information contact Gyll Turteltaub, 3-6608, or [turteltaub3@llnl.gov](mailto:turteltaub3@llnl.gov).



## NEWS YOU CAN USE

# Lab's vehicle barrier wall access routes to open

By this time, most employees have seen the vehicle barrier wall that has been installed around critical buildings at the Laboratory. There are three locations where active barriers have been installed to permit vehicle entry to areas within the wall's perimeter:

- Post 2B: located on 2nd Street. This location is a sally port configuration with two barriers.

- Post 1D: located off 1st Street next to Bldg. 329. This is for access into the Bldg. 321 yard.

- South Gate Drive: located on South Gate Drive next to Bldg. 324.

These locations are the only routes that will permit vehicle access to areas or buildings within the wall's perimeter. The Security Department plans to have the barriers activated starting Monday, April 11, from 6:30 a.m.- 6 p.m.

Requirements for vehicle access through

these barriers are as follows:

- Post 2B will be the only location staffed by Security Police Officers (SPO). To enter through one of the other two locations, vehicle drivers will first have to telephone the Protective Force Division dispatcher at 2-7222 and request access.

- Only authorized vehicles are allowed access. The requirements for access via Post 2B and Post 1D next to Bldg. 329 are the same as for Limited Areas: all persons must have an "L" or "Q" badge, or be under appropriate security or administrative escort; vehicles must display U.S. government license plates, or an authorized LLNL issued Parking Permit for Limited Areas; entry via the portal at South Gate Drive, near Bldg. 324, requires that all persons must be authorized to enter a Property Protection Area (gray, yellow, or blue



badge) or under appropriate escort, and vehicles must display U.S. government license plates, or an LLNL issued parking permit, the same type that is issued for parking in Limited Areas.

- A cursory search of your vehicle will take place before access is granted.

- No pedestrian traffic or bicycles will be allowed access through or around the barriers at these locations.

Employees are reminded to be aware of all safety signs or signals and to follow Security Police Officer (SPO) instructions at all times. Also, employees who call PFD to get access through portals at Post 1D into the Bldg. 321 yard, or South Gate Drive near Bldg. 324 may experience delays in response by a SPO, depending upon PFD priorities at that time.

## Technical Meeting Calendar

Friday  
**8**

### INSTITUTE FOR GEOPHYSICS & PLANETARY PHYSICS

"First Scattered Light Images of Nearby Debris Disks and Evidence for Extrasolar Planets," by Paul Kalas, U.C. Berkeley. Noon, Bldg. 319, room 205. Property protection area. Foreign national temporary building access procedures apply. Contact: Wil van Breugel, 2-7195, or Lisa A. Lopez, 3-0250.

Tuesday  
**12**

### LIVERMORE COMPUTING /COMPUTATION

"Simulations of Water in Giant Planets: Discovery of Symmetric H-Bonding in the Superionic Phase," by Nir Goldman, Chemistry and Materials Science Directorate. 9:45 a.m., Bldg. 453, room 1001, Armadillo Room. Common use facility. Foreign nationals may attend. Contact: Jean Shuler, 3-1909.

Friday  
**15**

### CHEMISTRY AND MATERIALS SCIENCE FRONTIERS SYMPOSIUM

"Colloidal Nanocrystals: Synthesis, Properties, Applications," by Paul Alvisatos, UC Berkeley. 10:30 a.m., Bldg. 155, room 1101, auditorium. Common use facility. Foreign nationals may attend. Contact: Mike Fluss, 3-6665, fluss1@llnl.gov or Kathleen Moody, 3-5948, moody2@llnl.gov.

### INSTITUTE FOR GEOPHYSICS AND PLANETARY PHYSICS

"Supernovae: How Do They Burn and How Do They Explode?" by Lifan Wang, Lawrence Berkeley National Laboratory. Noon, Bldg. 319, room 205. Property protection area. Foreign national temporary building access procedures apply. Contact: Kem Cook, 3-4634.

Tuesday  
**19**

### PHYSICS AND ADVANCED TECHNOLOGIES/ FUSION ENERGY PROGRAM

"Advanced Solid State Lasers for IFE," by Ray Beach, NIF LS&T. 3 - 4:15 p.m., Bldg. 543, room 1258, Grand Canyon Room. First in a series of "Fusion Opportunities Forum" seminars. Property protection area. Foreign national temporary building access procedures apply. Contact: Don Correll, 2-6784.

Thursday  
**21**

### NAI COLLOQUIUM

"Nuclear Assessment," by Robert W. Allen. 2 p.m., Bldg. 132S, room 1000 auditorium. Building access requires "L" or "Q" badge. Contact: Ruth Wright, 3-7328.

Friday  
**22**

### INSTITUTE FOR GEOPHYSICS & PLANETARY PHYSICS

"Polarimetry, Circumstellar Disks, and Clusters in the Magellanic Clouds," by Karen Bjorkman, University of Toledo. Noon, Bldg. 319, room 205. Property protection area. Foreign national temporary building access procedures apply. Contact: Bob Becker, 3-0664.

May  
**6**

### INSTITUTE FOR GEOPHYSICS AND PLANETARY PHYSICS

"Nearby Galaxies as Revealed by the Spitzer Space Telescope," by Robert Kennicutt, Steward Observatory, University of Arizona. Noon, Bldg. 319, room 205. Property protection area. Foreign national temporary building access procedures apply. Contact: Wil van Breugel, 2-7195 or Lisa A. Lopez, 3-0250.

May  
**13**

### INSTITUTE FOR GEOPHYSICS & PLANETARY PHYSICS

"Is Anybody Out There? IR, Visible & Radio SETI with Five Million SETI@home Volunteers," by Dan Werthimer, U.C. Berkeley. Noon, Bldg. 319, room 205. Property protection area. Foreign national temporary building access procedures apply. Contact: Wil van Breugel, 2-7195 or Lisa Lopez, 3-0250.

May  
**20**

### INSTITUTE FOR GEOPHYSICS AND PLANETARY PHYSICS

"Stellar Interferometry at Mid-IR Wavelengths: The Characteristics of Old Stars," by Charles Townes, U.C. Berkeley. Noon, Bldg. 219, room 163.

June  
**3**

### INSTITUTE FOR GEOPHYSICS AND PLANETARY PHYSICS

"A Simple Explanation for How Gravitational Collapse Can Lead to Supernovae and Dark Matter," by George Chapline, N Division. Noon, Bldg. 319, room 205. Property protection area. Foreign national temporary building access procedures apply. Contact: Dave Dearborn, 2-7219 or Lisa Lopez, 3-0250.

**The deadline for the next Technical Meeting Calendar is noon, Wednesday.**

Please submit your meetings via the new Technical Meeting Calendar form on the Web, located at <http://www->

# Kinetic Chelle Clements is a Lab community force

By Linda Lucchetti

NEWSLINE STAFF WRITER

When you talk with Chelle Clements, you immediately notice an excitement, a joy of living.

"I'm just a high energy person," the Lab employee of 22 years will explain modestly when asked where she gets her enthusiasm. Add to that, the fact that she loves what she is doing. A senior scientific technologist in B Division, Clements works on the Nuclear Weapons Information Project.

But, if you delve a little further, you're bound to uncover an additional source of her happiness — she loves helping others.

"Community service isn't an option. We are all brothers and sisters, and we have to help each other," Clements believes. And, with this belief, she lives out each day.

Clements is affiliated with several Lab organizations and outreach efforts, including the Lab's Armed Forces Veterans Association (LLAFVA), herself having served in the U.S. Army; the LLNL Women's Association, (LLWA), where she currently serves on the scholarship committee, and previously served as president and vice-president; Expanding Your Horizons in Math and Science (EYH), where she has chaired past events and presented workshops; and the Tri-Valley Science and Engineering Fair, where she has served as science project judge and team captain.

In March, Clements participated in the B Division/LLWA co-sponsored used book sale and was thrilled with the event's success as well as the number of volunteers she helped to recruit for the fundraiser.

"People like to volunteer, but sometimes you just have to give them specifics," Clements states, adding that people are willing to help, but may require more details and parameters about a project. "Something as simple as assigning specific times is useful in recruiting volunteers."



JACQUELINE MCBRIDE/NEWSLINE

Chelle Clements

## Community **CHAMPIONS**

Clements' background provides a success story she shares with young women whom she mentors in the various programs. In the 70's during the Vietnam War, she enlisted in the Army and served two years in Germany. She remembers that back then, within her Corps of Engineers unit, she was the only one of six women who finished their tour of duty within her platoon.

Obviously, being a veteran is one reason for her connection to the Lab's Veterans Association. Last December, she helped to organize a motorcycle ride to Site 300. More than 100 motorcyclists drove from the Lab's East Gate to Tesla Road and out to Site 300 while raising \$3,117 in the process. The funds were donated to U.S. Army A Company 8th Engineer Battalion in Baghdad.

Clements' volunteerism doesn't end with the work day. Last Thanksgiving and Christmas, she coordinated donations from the members of the LLAFVA for dinner and gifts at Berkeley's Ashby House, a small transitional housing project offering homeless veterans a temporary residence and support services. She has also been very involved in the East Bay Stand Down since 1999, a weekend program designed to help veterans get medical care, find homes and career guidance.

Clements joined the Laboratory equipped with an associate degree in environmental science acquired after her discharge from the Army. Through the Lab's educational assistance program, she was able to return to school and complete her bachelor's degree. With the help of the Women's Association, she was awarded three scholarships that later helped her earn a master's degree in information systems.

As far as her interest in educational outreach, Clements feels that to attract more young women in careers in math and science, there needs to be more positive role models with whom they can talk. "Young women need to know that women in math

and science careers, are "o.k." — we're fun, nice people, and many of us have raised children."

Another attribute Clements has is her persuasive nature. "People tell me I'm a good salesperson," Clements laughs. And many of her co-workers and friends who have "caught the fever" and found themselves joining her in her latest effort will agree.

Clements believes that helping others, getting involved and being supportive of others is fun, feels good and is great for her organization as well as the Laboratory.

Some people will do things only if there is a reward. But, for Clements the reward is in the doing. "I love the interaction with people both in my job and in the community, and I like to find solutions to issues that need help."

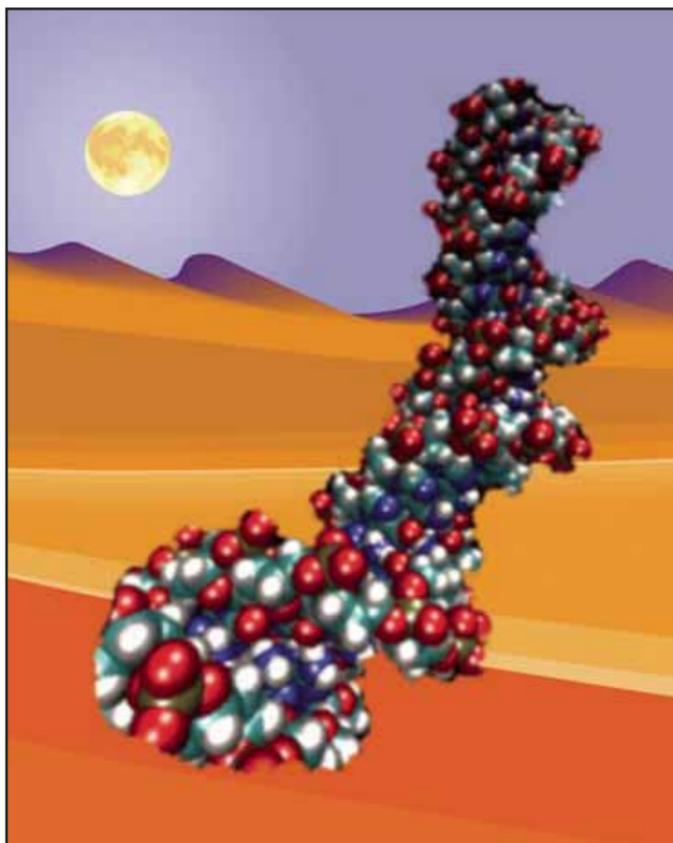
## GENES

Continued from page 1

Ovcharenko and his colleagues reveal that a particular feature of two large gene deserts — their location on either side of two closely related genes active in the human brain and heart — has persisted through hundreds of millions of years of evolution, even though the DNA sequence within the deserts has changed considerably over time.

In a paper published last December in the journal *Genome Research* (see *Newsline*, Dec. 10, 2004), Ovcharenko reported that such "variable" gene deserts were less likely to contain DNA sequences that play a role in regulating gene behavior than "stable" deserts that have remained relatively unchanged over time.

The fact that the "architecture" of the deserts — their location in relation to the same genes — has persisted over long evolutionary periods could be significant, Ovcharenko said. The protein made by the genes, called "protocadherins," is thought to function in cell-to-cell recognition and adhesion but hasn't been definitively characterized yet.



"We were surprised to see how old they (the deserts) were," Ovcharenko said. "They

appeared at a time point that follows the divergence of fish from *Ciona intestinalis* (the sea squirt) but precedes the divergence of mammals from fish. They have no obvious function, but for some reason they were preserved at that location in the genome. This makes us wonder what's special about these variable gene deserts."

"The deserts contain short, specific non-coding segments that may well be sites of gene regulation such as transcription factor binding sites - areas on the DNA where molecules can bind to change the activity of the protocadherin gene or other genes," said the *Nature* paper's lead author, LaDeana Hillier, senior research scientist at the Genome Sequencing Center (GSC) at Washington University School of Medicine in St. Louis. The GSC led the international team that sequenced and analyzed the two chromosomes.

"As we compared these areas to other genomes," Hillier said, "we were intrigued to find both these short segments and this gene desert structure has been maintained in mammals and birds."

Ovcharenko said the information obtained from the analysis of chromosomes 2 and 4 will lead to further study "to see why some genes in the human genome tend to have gene deserts in their neighborhoods."



## CLASSIFIED ADS

See complete classified ad listings at  
<https://www.ais.llnl.gov/newsline/ads/>

### AUTOMOBILES

1998 - Ford Explorer LTD, AWD, V8, tow, moonroof, leather, AC, 6 disc CD, pwr/dig extras, one owner, good cond., 125K, asking \$8700. 530-470-9170

2001 - VW Jetta 1.8T Turbo, \$12,450, 40,900 miles, received 40k service, 5 speed, premium sound & wheels, dual air bags, sun roof 925-443-0749

1997 - Chev Astro Van LT 75K miles, 8 passenger, rear heat/air, pwr seat, ABS, CD & cassette, many more factory options, drives & runs great, \$6700 obo 925-294-8182

2002 - Toyota Sequoia Ltd. Silver. Loaded: Third Seat, Moon Roof, Rear A/C, Dvd Player. 72,000 Fwy Miles. \$25,500 Obo 510-708-1852 Or 925-820-0744

2002 - Mustang GT Convertible, V8, 5-speed, fully loaded, 27,800 miles, excellent condition. \$17,600 or best offer 925-292-3355

1988 - White Ford Escort/Turbo-\$1,200 Great Condition 209-862-1567

1985 - Mazda RX-7 GSL, ocean blue metallic w/ gray interior. Good condition with damaged left rear quarter panel. 125k miles, original owner. \$1300. 925-454-5305

1998 - Ford Contour SE sedan. Excel cond. 4 cyl, 2.0L, A/T, front wheel drive. AC, tilt wheel, am/fm stereo, dual front air bags. 63K miles. \$3400/OBO 209-599-8308

1988 - 1998 Honda Accord LXI. Great condition AT.AC.PW.CC.PB. Just tuned up, new brakes. Sacrifice \$2000 obo. 925-516-9678

1980 - Ford E-150 Conversion, original owner, needs a valve job. \$1550 obo 209-823-9309

2001 - Honda CRV 2WD 65K miles. Maintained every 5000 miles since brand new, Good dependable transportation. \$9500.00 209-351-0631

1990 - Acura Legend 2dr 5sp loaded, sunroof hot sound system high miles run great body straight. \$2,800 obo 925-373-0823

### AUTOMOBILE ACCESSORIES

15 inch TIRES: Two 235/75/15 good tread, one mounted on 6 bolt rim \$25/ both. Livermore. 925-447-7070

Set of 4 (5-lug) Chevy wheels w/good tires. \$25/ea. OR \$90/set. 925-371-1705

1:24 scale die cast stock car, Elliott Sadler 38, M&M, Yates Race Team. Retail \$75. Brand new in unopened box. \$30 925-648-0671

2003 - Two new wheels and tires from 2003-BMW-325, 7 spoke design. Tire size 205/55R16. \$50 each. 925-935-5004

### BICYCLES

Bontrager Race Disc wheel 28 spoke yellow came off Gary Fisher mtb straight couple of minor scratches on paint wheel only no hub \$150obo 408-712-1730

Bicycle, Murray, girls \$25. 925-706-2088

2001 Quintana Roo kilo, 57cm like new with spinergy rev X wheels, ultegra, fsa, crank, Worth over \$2500 will sell for \$1200 209-551-5514

### BOATS

1967 SeaRay 18foot in-line 6 165 hp bimini top recent tune-up runs great trailer in good condition good tires/spare. \$4,200 OBO 925-447-4797

1998-18ft. Blue Water Shadow IO 190 Merc. with trailer. Open Bow. 40 hrs. \$9000 or Best Offer. Picture available upon request. 925-449-4326

1987 21ft. Bayliner Cuddy Cab. Low hours on engine. Sleeps two comfortably, \$6000 obo, 209-825-8130

2001 Maxum 2400 SCR 25ft cabin cruiser v8 Mercruiser 5.7 EFI 80hr windlass, sleeper, head, shower stove, fridge, microwave anodized trailer \$37k OBO 209-833-6858

### CAMERAS

Sigma 28-200 zoom lens, up to 4x, Nikon mount, \$110. 925-377-6537

### ELECTRONIC EQUIPMENT

Computer, digital name, with monitor, both \$55.00 925-735-6002

HP 697C Injet Printer. Works great and very reliable. Good for college student or child's first computer. \$30. 925-964-0534

HP COLOR printer, like new, hardly used. A good price. 30.00 510-537-7222

Kodak instamatic M105 movie projector, \$50 OBO. 925-706-2088

iMac DV 400 mhz, stock but RAM upgraded to 640 MB, \$250. 209-832-3213

### GIVEAWAY

Slightly used moving boxes. 925-484-3162

Bass Player Magazines. approx. 100 issues. 209-521-2015

Wood stove insert, has blower,

old but in good condition. 925-447-4797

Approx. 150 feet of redwood fence wood. 1x8, 1x4, 2x4, and 2x6 pieces. Painted. 925-513-4767

Cage, with two Rats plus supplies. Kids don't play with them enough, need better home. Two gentle males who love being held. 925-443-7729

Health Rider, Good condition 925-373-1530

Old AM/FM Sony STR-AV260 stereo receiver. Volume slide switch does not work. Excellent for the do-it-yourself fix-it techno person. 925-837-8626

Giving away a nice sofa and leather chair. Sofa is navy blue with a paisly design. The chair is also navy blue. 925-784-4359

### HOUSEHOLD

Lopi Fireplace Insert. Excellent Condition, barely used. \$500 obo. 925-550-3809

36x60 Glass top dinnette table with four chairs \$200.00 925-606-9847

Oversized love seat and couch. Off white with embroidered design. Excellent condition, minimal use. Must see. \$200. Pictures available. 925-964-0534

Small computer desk \$50. Computer cart \$30. 925-706-2088

Refrigerator \$100, clothes dryer \$50, L-shaped off white sofa \$200, glass/brass lamp end table \$10, table lamp \$5, all excellent condition. 925-455-8238

Weber Genesis gas grill, 3 burner w/ cart. Works great, excellent results! \$50. 925-454-5305

Sofa & loveseat, geometric pattern w/brown/green/cream tones, good cond. \$275.00 OBO Coffee & end table (oak w/glass top), good cond. \$75.00 OBO 510-792-1538

New solid oak china cabinet NICE! \$595 OBO Have pics avail 209-543-0572

Memory Foam Topper Pad, 3 inches thick, Cal King, great condition, \$75 or best offer. 925-829-3226

Waterbed, waveless mattress, raised platform, headboard with mirror/shelves. \$50 209-895-7050

Oak Entertainment Center, 3 pc w/smoked glass - \$700. Oak coffee and 2 end tables - \$250. Call after 6 pm. 925-454-0330

Washing Machine, Kenmore, heavy duty super capacity plus quiet pack. Great Condition. 7 years old, lightly used. \$100.00 OBO 925-371-1433

### LOST & FOUND

Ladies watch. Lost near B415 on March 17th. Gold and brushed silver. Gift from husband. 209-835-5075

### MISCELLANEOUS

Picture frames, large, 16x20 or so, six all \$20 925-735-6002

Evenflo stroller/car seat/carrier combo. Good cond. used about a year. \$25 209-365-0412 209-365-0412

Garage Sale 4/9 9am-2pm. 1541 Tule Ln, Knightsen - between Delta Rd. & Cypress 925-550-3809

ABBA FANS. 4 CD set, limited edition collection. Includes book giving ABBA history. Excellent cond. 15.00. 510-537-7222

Costco Sunray Playground Set, 9 months old, already assembled, you haul away. Costco price is \$1199; sell for \$800. 925-373-7658

flannel sheet sets, twin size, one Toy Story, one Winnie the Pooh, like new. \$10. per set 925-706-2088

24x36 starret surface plate, like new w/stand & cover \$800 obo. 510-728-0144

Giants Tickets. Face value. Great seats! View Box 319, Seats 8 & 9, second row. Call for list. 925-828-6210

Welding Equipment, Plasma Cutter, Wire Feeder, Tri-Stand Vice, Air Compressor, Air Tools & More 925-348-1443

### MOTORCYCLES

2000 - Buell Blast. Low miles, 498 cc, extra accessories. Picture available. \$2500 OBO. 209-869-2833

85 - Handa 250 Reble runs well looks great \$900 obo, and 82 Yamaha 550 SECA runs well looks great \$1800 obo both aprox 20K miles 925-846-2925

2003 - 2003 Yamaha TTR 225 w/Green sticker, low miles: extras. \$2,800.00 OBO 209-835-3938

2001 - Motorcycles 4Sale: Honda XR 650 L street legal or just dirt-currently has a Green sticker. 3,300 miles w/extras. \$3,500.00 OBO 209-835-3938

Joe Rocket Atomic Motorcycle Jacket w/Liner. Grey/Black, 4yrs old, very good condition. XXL \$40 925-813-2224

1992 - Honda VFR750 Interceptor. Great running machine. Salvage Title. Extras. Sacrifice \$2500 or best offer. 925-516-9678

2004 - BMW K1200GT Blue

Metallic, Excellent Condition, 1700 miles, Six year Unlimited Warranty, Give me a call or page 05824 \$14,250. Make an Offer 209-475-0862

1984 - Harley-Davidson FXR custom. Laced wheels lots of chrome & extras. \$11,000.00 Or reasonable offer. 209-351-0631

### MUSIC INSTRUMENTS

Terratec phase 88 PC recording interface. 8 Analog I/O 24bit/96kHz, S/PDIF & MIDI. \$200 925-443-9182

Electric Guitar and Amp. My daughter would like to learn to play. Will pay \$100.00 209-239-2812

Upright Piano Wurlitzer with bench. Light wood construction. Pick/up Lathrop. \$250 OBO 925-784-2283

Gibson Les Paul Studio model with hard shell case. Transparent wine red finish with ebony fretboard. \$900.00 or reasonable offer. 209-351-0631

### PETS & SUPPLIES

Loving and playful Jack Russell Terrier. Female, 1 year old, spayed, vaccinated and wormed. \$350.00 925-462-7396

Boxer Pups, Purebred, Available 4/18/05. \$300-\$325. 209-835-8363

Parakeet cage 20. 925-706-2088

English saddle - All purpose Bates Caprilli, leather. Good condition. \$200/nego. Also pads, stirrups, girth. 925-829-3226

Very friendly hand raised Cockatiels, 11 weeks old, plus more younger ones coming up. 209-892-6589

### RECREATION EQUIPMENT

Bow, Jennings Promaster, 28inch draw, 60lb peak wt., \$250 925-447-6819

Rossignol Salomon Skis 2 pair 5-1/2 feet long with bindings. Uses only a few times. \$75.00 each or the pair for \$125.00. 510-782-2349

Charbroil Fire and Ice cooler/gas grill combo, brand-new, never used. \$120 925-443-4615

8ft x 4ft 3-piece slate pool table with cues, balls, and accessories, \$275. U-haul. 925-323-7380

KIRKWOOD lift ticket voucher. Good any day \$45.00 209-599-4644

Ladies golf clubs, Wilson Precision graphlite; full set irons, woods, putter and bag - \$125. Sparring gear, two sets, \$20 per set, one for child. 925-706-2088

Chest waders, size 12, Royal

## DNA

Continued from page 1

has been damaged by exposure to radiation or a toxic chemical and needs to be removed and replaced.

On its own, the polymerase wouldn't get very far before it lost contact with the DNA. As the polymerase chugs along each strand, it maintains a rather loose grip. The polymerase would fall off after adding only ten bases or so, said Daniel Barsky, a computational biologist in the Laboratory's Biosciences Directorate (BIO). It needs a placeholder, a tethered platform, to keep everything in place and moving forward along the DNA.

That platform, researchers have found, is a protein complex known as a sliding DNA clamp. The doughnut-shaped clamp wraps around the DNA and accompanies the polymerase, which bonds tightly to the clamp, on a high-speed roller-coaster ride, incorporating about 1,000 bases a second.

But how, scientists wondered, does the clamp itself interact with the DNA while moving along so briskly?

For some time it has been thought that there was an electrostatic repulsion between the DNA and the clamp, almost like a maglev train, Barsky said. According to this theory, the clamp would levitate away from the DNA and slide along its length without touching it.

But when Barsky and his LLNL colleagues began to examine the clamps structure, they found that its inner ring is studded with positively charged amino acid residues. Those residues are fully capable of forming electrostatic contacts known as salt bridges with the negatively charged phosphate backbone of the DNA helix causing Barsky and his team to wonder: Why does the clamp slide? Why doesn't it just remain bound to one place?

To answer the question, Barsky's team used a sophisticated molecular dynamics computer program

to create a two-nanosecond simulation of a clamp sliding along a 12-base-pair stretch of DNA. The simulation revealed that the movement of the DNA clamp is roughly analogous to that of the racehorse: Like the thoroughbred's hooves, alternately digging into the track and propelling the horse toward the finish line, the amino acid residues are forced to alternate in making contact with the DNA's phosphate backbone, giving mobility to the clamp.

While many of the salt bridges are energetically favorable (configured so they form an electrostatic bond), Barsky said, not all of the favorable contacts can occur at the same time, creating competition among them. The contacts between the protein clamp and the DNA keep changing.

Unlike the racehorse, which sometimes has all four feet in the air at the same time, the clamp always touches the DNA, just not with all of its feet at once, Barsky said. "It's the constant state of change resulting from alternating contacts that allows the motion."

Teasing out this kind of detailed information about the novel interaction between DNA and the protein clamp is important in helping scientists learn how life works at the most basic, molecular level. "That is the real strength of computational biology," Barsky said, "being able to understand the details of the molecular workings to the point of creating experimentally testable hypotheses."

In order to test hypotheses developed from the analysis of the DNA clamp simulations, Barsky is leading a collaboration between scientists at the Rockefeller University in New York and LLNL's Chemistry and Materials Science Directorate (CMS) to use a technique called single-molecule fluorescence resonance energy transfer to measure how fast the clamp can slide along DNA. By attaching a green dye to the protein and a red dye to one spot on the DNA, the team can measure light transfer and from that, infer the time between passages.

The system works like two successive pneumatic traffic meters used to measure the average speed of

passing cars, Barsky said. Eventually, he hopes to be able to alter the measured kinetics by engineering changes to the protein based on his molecular dynamics movie of the sliding clamp in action. "For example," he said, "we might be able to modify the interactions between the clamp and the DNA to take out some of the charged residues and the clamp may move faster."

Beyond such basic knowledge, Barsky said, the research is also valuable in determining how cells respond to DNA replication anomalies that can lead to cancer and other diseases.

The study of the biology and development of cancer is connected to sliding clamps, Barsky said. "For example, it's not well understood how the clamps interact with (carcinogenic) bulky lesions in the DNA that are induced by food mutagens, or indirectly by radiation. We know they (the lesions) can be bypassed, and were trying to understand the role of clamps in this process."

There are also long-term therapeutic ramifications, Barsky said. "We certainly want to know everything we can about DNA repair, since it's so central to the study of disease and aging."

In the long run, DNA clamps may end up on the parts list for nanomachines, used perhaps as a delivery mechanism or as a moving platform on a nanofilament.

Barsky reported his findings on DNA clamp movement at the recent annual meeting of the Biophysical Society in Long Beach, Calif. His "New and Notable" symposium talk was one of five talks and a dozen posters presented at the meeting by LLNL researchers, including five Physical Biosciences Institute (PBI) postdocs. Much of the research, including Barsky's, was partly or fully funded by LLNL's Laboratory Directed Research and Development Program.

The other Livermore researchers on Barsky's team were Ted Laurence (CMS), Christopher Hollars (CMS), Eric Yin (BIO), Julio Camarero (CMS), Michael Thelen (BIO), Michael Colvin (BIO) and Kenneth Kim (CMS).

Red Ball brand w/thermo-ply boots. \$20.00 925-961-1658

Telescope, Meade ETX-90AT with Autostar controller. Complete GO TO system with tripod and carry cases. New in January 2005. \$450.00/BO. After 5PM. 209-836-0116

3 Wheel Jogging Stroller Baby Trend Expedition \$50.00 510-796-3142

Cardioglide Plus push/pull exerciser, best buy Consumers, excellent condition, \$50. 209-895-7050

FactorX Skateboard Ramp for skateboard/rollerblade/BMX. 6ft Long ramp, 4ft wide, 3ft high plus landing platform. Paid \$200 new, asking \$65. 209-835-9490

### RIDESHARING

Express your commute, call 2-RIDE for more information or visit <http://www-r.llnl.gov/tsmp>.

Pleasant Hill/Concord/WalnutCreek - Save on Gas! Seats available on luxury van. Arrive LLNL 7:35AM; Depart 4:30PM. 925-947-6969, ext. 2-4206

San Jose/Fremont - 14 passenger van needs riders; Leaves San Jose/Berryessa 6:40; leaves Fremont/Mission 7:00; arrives LLNL 7:30; leaves LLNL 4:30. Very reliable. 408-238-1909, ext. 3-3057

Modesto - Working 4-10s and looking for a vanpool? We have a

space available 4/1. We work 6am to 4:30pm Mon. thru Fri. 209-667-2365, ext. 2-8321

Martinez/PH - Looking for a 4th member of carpool. Arrive 7:30 Leave 4:30. Meets in Mtz. Will consider PH pickup. 925-228-3759, ext. 3-7857

### SERVICES

ClutterLess(CL) Self Help Group. Clutter stressing you out? Mondays 7-8:30 PM. Come: Pleasanton Presbyterian, Rm 7, 4300 Mirador Drive, or call 925-462-1406

Clean houses,alameda & contra costa county. 510-388-7197 references available 510-502-5483

QUALITY PAINTING, take advantage of low season discounts. Excellent references, prep work and workmanship. 25 yrs exp. Call before it gets too hot. 510-537-7222

CARPET/LINOLEUM/LAMINATE. Household/commercial. Over 20 years experience, licensed/bonded/insured. Discounts for Lab employees. 925-516-9510

Summer child care by a reliable, responsible high school student. Transportation available, reasonable rates, references available. 925-456-3010

### SHARED HOUSING

Livermore - furnished room for rent. Clean/quiet/pool. Close to bus/bike path. No pets/no smok-

ing. \$550.00/month. Share utilities. Deposit. Mature adult. 925-449-1128

Livermore - - Room for rent in very clean 2br apartment. Walking distance to Lab! No pets/no smoking. High Speed Internet, cable, phone. \$600/mo incl. utilities. 925-454-3016

Livermore - Two miles from lab-clean house for male or female. No pets and no smoking.Kitchen/laundry priv. call for details. 925-337-0696

Livermore - Share 4bd/2.5 ba with another person. South side location; walk to library, downtown. \$650/month, utilities included. No pets/smoking. Quiet. 925-373-6813

Livermore - Furnished room near Lab. No smoking, pets, stereos, or guns. \$450/mo plus share utilities plus deposit. 925-455-6044

### TRUCKS & TRAILERS

1995 - Chevy 2500 ex/cab long bed, 4x4, diesel engine, runs excellently,gooseneck hitch, great shape, \$8000 209-832-7655

2001 - 19 foot Kit Companion, tandem axel, used twice, many extras, must see, Blue Book \$12K, sell for \$9,500 925-443-1539

2004 - Utility Trailer, 4x6 ft, class 3, large 15 inch wheels/tires, quality construction, brand new condition, \$725 obo 925-443-3970

2001 - Chevy Silverado LS, White, 67K miles, PW, PL, AC, CC, AT,

Tinted Windows, Tow Package, Call for more details. \$12,000 OBO 209-483-8719

2003 - GMC Sierra 2500HD 4WD Crew SLT, white/Graphite leather, 6 CD, dual flowmasters, Linex liner, custom wheels/tires/grill, 1.5in lift, 31K or BO. 209-629-2196

1962 - Ford F-100, long bed, 292 v8, auto, runs good, solid body, excellent work truck or ready to restore. \$1800/obo 209-740-7138

1989 - Isuzu pickup w/camper shell. Runs good. \$1500 OBO. 925-606-9629

1996 - RANGER XLT, good running work truck. Bedliner, cassette, V6, extra cab, A/C, alarm. Good condition. 5,500.00 OBO 510-537-7222

1999 - Chevy S10 Ext.Cab,third door,4cyl 2.2,5speed,2wd,tool box, Stereo/disc, LS, AC, PS, Airbag, ABS, BedLiner, Tow pkg.Alloy Whls. 55k miles \$7300.00 925-890-2060

2003 - GMC Sierra SLE 5.3L V-8, 2WD, 4DR, Power everything, excellent condition, new tires, 42k miles, \$17,500 209-915-4354

2003 - Wilderness camping trailer, 27 feet, with slideout. Like new, \$16,500. Call after 2:00 on cell 209-814-1165 or 209-835-8938

### VACATION RENTALS

Anaheim, CA - - 12/17-24/05 Can walk to Disneyland, 1 BR, slps 4,

kitchen, swimming pool, \$710/week or 3 night minimum @ \$125/night. 925-449-6048

Clear Lake, Nice, CA - - Townhouse slps 6, 8/5-12/05, Week \$875 or 3 night minimum at \$135-145/night depending on weekend or weekday stay. 925-449-6048

Cold Springs, CA. - Sleeps 10-12. 5 min to Pinecrest Lake & Strawberry Snow Park, 20 min Dodge Ridge & Beardsley Reservoir, 30 min to Black Oak Indian Casino. 925-240-1206

Maui, HI - Kahana Reef oceanfront 1BR/1BA condominium. Beautiful two-island view, oceanside pool, and BBQs. LLNL rates for year-round reservations. 925-449-0761

SOUTH LAKE TAHOE - 3 Bedroom 2 Bath Chalet, comfortably furnished, all amenities,close to all skiing,RESERVE NOW! HURRY FOR SKIING/WINTER FUN!! 209-599-4644

Perfect location for skiers! Tahoe cabin for rent 2 blocks from Heavenly. Sleeps approx 8 adults. \$400/wk, \$200/wknd. 240-1615

### WANTED

Tow dolly in good shape for reasonable price. 925-443-5028

Need a Toddler Bed or Crib in good shape. 925-931-0383



## LLNL'S WILD SIDE By Jim Woollett

# Local effort to protect majestic golden eagle takes wing

**B**oth the Laboratory's Livermore site and Site 300 reside within one of the largest known populations of golden eagles in the world. Eagles have been observed hunting ground squirrels in the buffer zones of the Lab's main site and nesting on remote hilltops at Site 300. This federally protected bird-of-prey has special meaning to native peoples as well as other area residents today, particularly because of the wild lands it calls home.

They are found from Northern Alaska and Canada southward through the intermountain regions (Rockies, California's Coastal Ranges, etc.) to central Mexico and western Texas. The numbers of breeding pairs within the U.S. has been estimated to be only about 17,500 pairs.

The golden eagle is not directly related to the bald eagle, our national symbol, but would be more aptly described as a distant cousin. In an ecological role, bald eagles tend to be associated with water and fish populations whereas the golden eagle is found in interior, upland areas that are drier and offer small mammals, such as ground squirrels, as a food source.

Recent efforts to understand the local eagle population reveal several significant threats to the birds. The Laboratory is working to protect the local population of golden eagles.

### Protecting the local eagle population

In the mid-nineties, Site 300 participated in a golden eagle population study that included the Altamont Pass and Wind Resource Area. The University of California, Santa Cruz (Predatory Bird Research Group) led the study in assessing the demographic attributes of eagles that lived and foraged within the Diablo Mountains. The initial study was funded by the wind industry and the Department of Energy's National



Soaring immature bald eagle (shows similar coloration with golden eagle).



A nest platform for a pair of nesting eagles.

### All about the golden eagle

The golden eagle (*Aquila chrysaetos*) is among the largest birds-of-prey in the United States with wingspans reaching 2.3 meters (7.5 feet) and weighing up to 7 kg (15.4 lbs).

**Size:** Female golden eagles are typically larger than males by roughly 25 percent. This difference is likely due to the role each gender plays during the breeding season. Female eagles incubate and guard the nest while the male provides food. The larger size of the female improves her ability to brood eggs and defend the nest site, while the male's smaller size allows him improved acceleration and the ability to carry larger prey relative to his weight.

**Coloration:** Golden eagles do not display adult plumage until their fifth year. The adult plumage is primarily dark brown and distinct from the juvenile which has conspicuous white feathers on the underside of the tail or in the wings at the carpal joints. The recognized "golden" coloration on the neck and head of adult birds are aged feathers that have become bronzed (bleached) from the sun over time.

**Habitat:** Golden eagles prefer open, topographically-rich terrain typical of the Diablo and Coast Ranges. Throughout the western U.S., golden eagles can be found inhabiting foothills and mountains in arid and Mediterranean climates. Much of the remaining eagle habitat in Central and Southern California occurs on private ranches and properties that are remote islands of open shrublands or oak savannahs.

**Food sources:** Prey eaten by golden eagles in the interior coastal range consists mostly of ground squirrels and jackrabbits. Golden eagles



will consume carrion in the winter when food is scarce and are capable of exploiting waterfowl concentrations (i.e., migratory ducks and geese) as well. Prey diet can also include snakes as their frequency or availability allows.

**Breeding behavior:** A particular flight pattern referred to as "undulating flight" is commonly exhibited by eagles in this area. This display consists of a series of steep dives and resulting upward stall-outs with wing-flapping at each apex. Undulating flight is considered to be a courtship presentation, but also may be used to demonstrate territoriality.

The relatively long length of time (generally 5 years) required before an eagle can breed coupled with "similarity of appearance" between both juvenile bald and golden eagles led to the congressional approval of the Eagle Protection Act of 1940. This Act protects bald and golden eagles, their nests, eggs, feathers and occupied habitat, from disturbance and "take" without the appropriate federal and state permits. This law has assisted in the recovery of both golden and bald eagles in regions where they both occur.

Renewable Energy Laboratory and relied on the use of small radio telemetry devices that tracked individual birds from birth to death.

Tens of golden eagles that were resident at Site 300 were captured/outfitted with radio-transmitters and released during this time period. A total of 179 eagles were caught in the Wind Resource Area (including those at Site 300) and each were tracked for over four years. Results indicate that on average 40-60 sub-adult and adult eagles are killed by wind turbines in this area each year.

Eagle wingspans are large enough to span the live conductors on most utility poles and up to 70 percent of the bird electrocution fatalities in the western U.S. are estimated to involve eagles. During 1994-1997, Site 300 installed protective covers on power pole conductors that are preferred perches for birds-of-prey species on the property. These protectors were instrumental in saving numerous hawks and eagles from electrocution. Additionally, in 1997 a nest platform was established for a pair of eagles that were attempting to nest on an adjacent power pole. A potential fatality was avoided.

Over the past 15 years, interest in protecting and studying golden eagles in the Altamont Pass region has involved dedicated researchers from the state and federal governments, private institutions, and the public-at-large. What they have learned is invaluable to making key wildlife management decisions pertaining to the survival of this unique population of birds-of-prey.



Measurement of golden eagle wing by researcher.



Golden eagle lifting from its perch (high voltage powerpole) showing phase protection to avoid electrocution (black object on center phase) at Site 300.

Photos by Jim Woollett

Newsline  
UC-LLNL  
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